MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/2016

POC0335 – ORGANIC CHEMISTRY

(Foundation in Life Sciences students only)

4 MARCH 2016
3.00 p.m. – 5.00 p.m.

(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **5** pages only excluding the cover page.
2. Answer **ONE** out of **TWO** questions in **Section A**, and **ALL** questions in **Section B**.
3. Please write all your answers in the answer booklet provided.
4. Distribution of marks for each question is given.

SECTION A [20 MARKS]

Instructions: Answer **ONE** out of **TWO** questions.

Question 1 [20 marks]

a. Write the structural formula for three isomers with the molecular formula C_5H_{12}. Which of these has the highest boiling point and why? [4 marks]

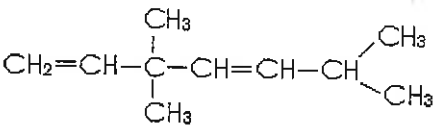
b. Identify the chiral carbon and draw two enantiomers for 1, 2-dichloropropane. [4 marks]

c. Write the structures and names of all possible isomers of an aromatic compound with the molecular formula, C_7H_7Cl. [4 marks]

d. Give the IUPAC name of the following structures: [2 × 2 marks]

(i) $CH_3-(CH_2)_3-C\equiv C-(CH_2)_3-CH_3$

(ii)



e. Give reasons for the following: [2 × 2 marks]

(i) 2-Butene shows cis-trans isomerism whereas 1-Butene does not.

(ii) Physical properties of geometrical isomers differ while those of enantiomers are the same.

Question 2 [20 marks]

a. Explain the following statements. [3 × 2 marks]

(i) The boiling point of isomeric alkanes decreases with increase in branching.

(ii) Methane does not react with chlorine in the dark at room temperature.

(iii) Members of a homologous series show identical chemical properties.

b. For the reactions below, give full structural diagrams and names for all reactants and products. Also indicate any catalysts/reaction conditions for each reactions. [3 × 3 marks]

(i) The formation of 2-hexanol from 1-hexene.

(ii) The reaction between 2-hexene and hydrogen bromide.

(iii) The reaction between 3-hexanol and potassium dichromate.

c. 2-methyl-2-butene reacts with hydrogen iodide to form the major product P and traces of Q.

(i) Write the equation for the reaction that yields the major product P. [1½ marks]

(ii) Write the equation for the reaction that yields the product Q. [1½ marks]

(iii) Explain why P is obtained as the predominant product. [2 marks]

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SECTION B [80 MARKS]

Instructions: Answer **ALL** questions.

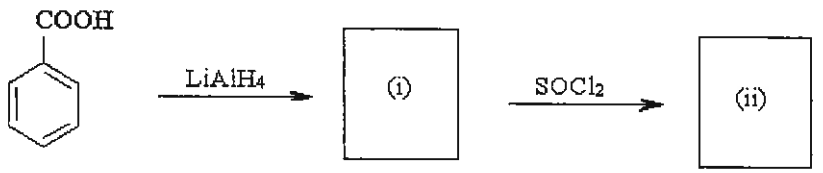
Question 1 [20 marks]

a. Starting from benzene, prepare the following compounds (in 2 steps). Complete the reactions with appropriate structures of products/reagents and state the name of each reactions. [2 × 6 marks]

(i) benzoic acid

(ii) *m*-bromonitrobenzene

b. Complete the following reactions (give the structures and names of the products).



[2 × 2 marks]

c. Normally, benzene gives electrophilic substitution reactions rather than electrophilic addition reactions although it contains double bonds. Why?

[2 marks]

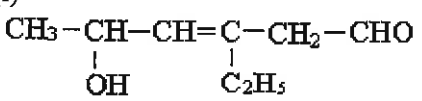
d. Nitration reactions of aromatic system usually give only one mononitro substitution product even when an excess of nitrating reagent is used. Briefly explain.

[2 marks]

Question 2 [20 marks]

a. Give the IUPAC name of the following structures: [4 × 2 marks]

(i)



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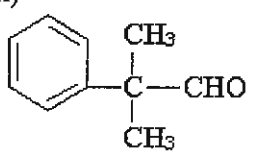

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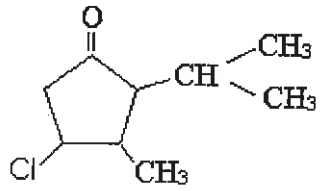
(iii)



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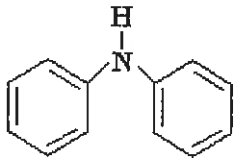
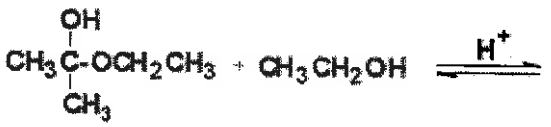


b. Complete the following reactions: [4 × 2 marks]

(i)



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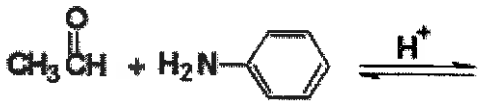

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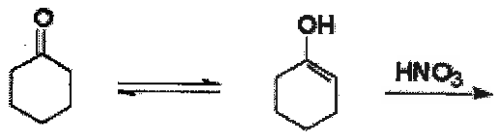

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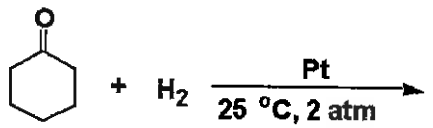

c. Give the chemical equation to show the preparation of carboxylic acids as given below: [2 × 2 marks]

(i) Ethanoic acid is prepared by heating under reflux a mixture of ethanol, potassium dichromate(VI) and dilute sulphuric acid.

(ii) Ethanenitrile is boiled under reflux with concentrated hydrochloric acid to produce ethanoic acid.

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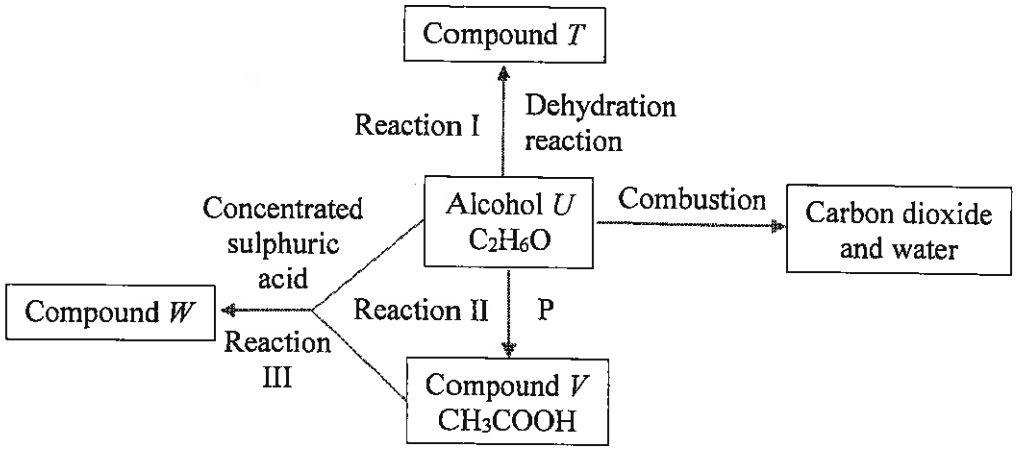
Question 3 [20 marks]

a. Explain why carboxylic acids show much higher boiling points as compared to alcohols of comparable molecular weights? [3 marks]

b. The diagram below shows the flow chart of a series of changes in reaction that occur to alcohol *U* that has a formula of C_2H_6O.



(i) Draw the structural formula of alcohol *U* and compound *T*. [2 × ½ mark]
(ii) What is the general formula for the homologous series of alcohol? [1 mark]
(iii) Write the chemical equation of the dehydration reaction in Reaction I. [1 mark]
(iv) What can be observed when compound *T* is shaken with bromine water? [1 mark]
(v) Name the product formed in (iv) above. [1 mark]
(vi) Write the balanced chemical equation for the combustion reaction of alcohol U in excess oxygen. [2 marks]
(vii) Name Reaction III. [1 mark]
(viii) State one characteristic of compound *W*. [1 mark]
(ix) Write the structural formula of compound *W*. [1 mark]
(x) Name the suitable chemical reagent of P in Reaction II. [1 mark]
(xi) State the observation in Reaction II if the chemical in (x) is used. [1 mark]
(xii) Compound *T* can be converted to alcohol *U*. Write the chemical equation for the reaction. [1 mark]

c. Write the structural formula for the following compounds. [2 × 2 marks]
(i) 4-oxo-3-methylbutanoic acid
(ii) 2-methyl-3-pentynoic acid

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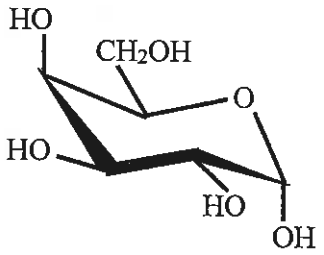
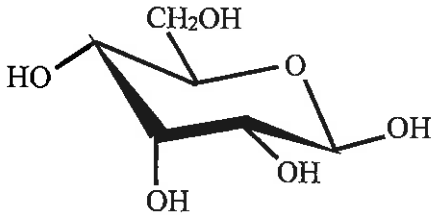
Question 4 [20 marks]

a. Convert each chair conformation to a Haworth projection (draw only the α-anomer) and then to a Fisher projection (draw only the D-monosaccharide): [2 × 4 marks]

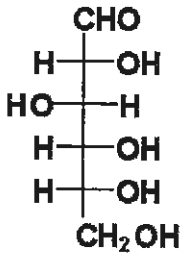
(i)



(ii)



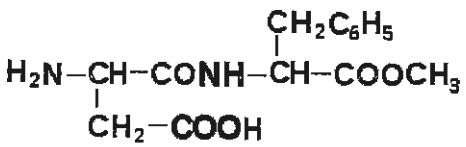
b. Draw and name the product formed if D-Glucose below undergoes: [2 × 2 marks]



D-Glucose

(i) reduction with $NaBH_4$ as the reducing agent
(ii) enzyme-catalyzed oxidation

c. Aspartame, an artificial sweetener, is a dipeptide and has the following structure:



(i) Identify the three functional groups. [3 × 1 mark]
(ii) Write the zwitter-ionic structure. [1 mark]
(iii) Redraw the above structure and indicate the peptide bond in the structure. [1 mark]
(iv) Write and name the structures of amino acids obtained from the hydrolysis of aspartame.

[3 marks]

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